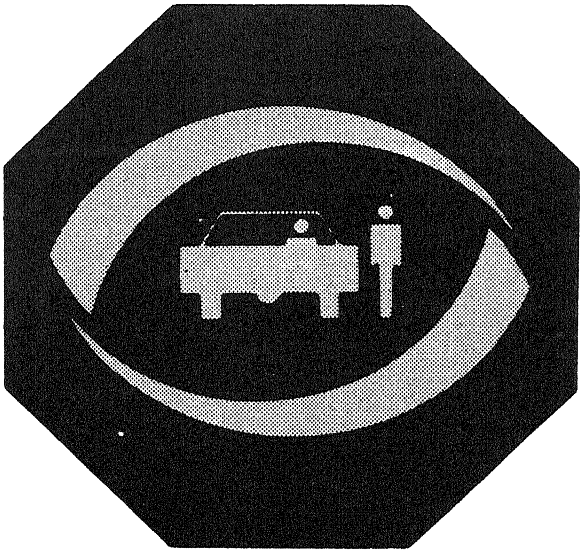
Shelve in Stacks S.B.T.
72-22

An Announcement of
Highway Safety Literature
. . . A Bi-Monthly Abstract Journal

HSL No. 72-22 November 17, 1972 HS-011 782 – HS-011 853; HS-800 696, HS-820 221; 222; 223

HSL No. 72-22
November 17, 1972



SPECIAL ANNOUNCEMENT
ON PAGE 21

THIS ISSUE CONTAINS
HS-011 782 – HS-011 853
HS-800 696
HS-820 221; 222; 223

U.S. Department of Transportation / National Highway Traffic Safety Administration

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An Announcement of
HIGHWAY SAFETY LITERATURE
. . . A Bi-Monthly Abstract Journal

Published twice-a-month by the National Highway Traffic Safety Administration,
Office of Administration
Washington, D.C. 20590

INTRODUCTION

Publications such as journal articles, proceedings, and research reports announced in *Highway Safety Literature* include some of the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 72 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series). NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-820 000 series are available for, purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array	
NHTSA Accession no .	HS-800 218 Fld. 5/21; 5/9
Title of document	AN INVESTIGATION OF USED CAR SAFETY STANDARDS--SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L
Personal author(s)	by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams
Corporate author	Operations Research, Inc.
Collation	
Publication date	1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol-6; PB-190 523
Abstract	Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.
	Search terms; Wear; Trucks; Failures; Used cars; Inspection standards

AVAILABILITY: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT–THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation .... Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

(Note: If the date of a report or Journal article is not given, the small letters nd will appear)

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NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1, and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

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* All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.

- /1 Brake Systems (102, 105-6, 116)
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NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U.S. Department of Transportation, National Highway Traffic Safety Administration.

AVAILABILITY OF DOCUMENTS
AND
INSTRUCTIONS FOR ORDERING

Articles and reports whose citations and abstracts appear in HSL are acquired from many sources, such as periodicals, journals, NHTSA Contractors' reports and NHTSA staff speeches, and other reports. Those reports other than NHTSA Contractors' reports and NHTSA generated reports and speeches (see introduction) are assigned a lower consecutive accession (HS-) number.

Department of Transportation personnel may borrow copies of publications announced in HSL from the NHTSA Technical Reference Division. Non-DOT Personnel, in the Washington, D.C. area, may borrow copies of publications for a 24-hour period only. Telephone (202) 426-2768. Government personnel in the Washington, D.C. area, use government ID phone 118-62768.

The names of the journals cited in HSL appear in *italic type* preceded by the words "Published in." The journal containing the article cited may be borrowed from most research and public libraries. Non-DOT personnel outside the Washington area should contact their company or agency libraries for assistance.

(Use any of the most recent *periodical directories* for location and price of publications cited in HSL)

NHTSA Contractors' reports and other reports can usually be obtained as indicated under AVAILABILITY. However, there is no certainty that copies will be available for more than a limited period after a report is issued.

The more common availability sources are identified by symbols which are explained in the next column:

NTIS: National Technical Information Service, Springfield, Va. 22151. Order by accession number: HS, AD, or PB. Prepayment is required by NTIS coupon, check or money order (made payable to NTIS). GPO coupons are not acceptable. Documents are available in paper copy (PC); in full size original or reduced facsimile, and on microfiche (MF) a 4x6" negative sheet of film (reader required).

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number. Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874), Give HS-No.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a $1 handling charge.

IMPORTANT NOTICE

WHEN REQUESTING a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS, add DOT/to the prefix HS-; example HS-800 000 should be ordered as DOT/HS-800 000.

1/0 ACCIDENTS

1/1 Emergency Services

HS-011 782 Fld. 1/1

ILLINOIS STATEWIDE TRAUMA CARE SYSTEM. STATUS REPORT

by Boyd, D.R.; Mains, K.D.; Flashner, B.A.

1972 7p 11refs

Reprinted from *Illinois Medical Journal* (Jan 1972).

A statewide system of trauma centers is being developed in Illinois. It will have some 40 specialized centers for the care of critically injured patients. These centers will be specially staffed and equipped to handle the complex needs of the critically injured. A critical injury index is given. Planning for ambulance services is discussed.

Search terms: Emergency medical services; Medical treatment; Ambulances; Injury severity index; Illinois; Hospital emergency rooms; Accident hospitals; State planning; Resuscitation

HS-011 783 Fld. 1/1

THE CRISIS IN AMBULANCE SERVICE

by Eisenhardt, C.A., Jr.

Published in *Nation's Cities* p20-2 (Sep 1967)

Prohibitive operating costs have forced many privately owned ambulance services out of business, leaving smaller cities with diminished or no ambulance service. Solutions to this problem are briefly discussed. Alternatives include an ambulance franchise, volunteer ambulance squads, hospital operated ambulance services, and police or fire department ambulance services.

Search terms: Ambulances; Economic factors; Financing; Emergency medical services; Contracts; Local government; Syracuse (N. Y.)

HS-011 784 Fld. 1/1

OUR GROWING AMBULANCE CRISIS

by Fry, D.

Published in *California Highway Patrolman* p8-9, 58, 61-3 (Oct 1969)

With the constant increase in California's highway traffic and a natural growth in injury cases as a result, the ambulance problem becomes increasingly critical. In case of a major disaster, it could become a crisis. Speedier service is one facet of the ambulance problem now troubling many California communities. In many cases the trouble appears to stem from inadequate, or nonexistent ambulance service, untrained ambulance personnel and occasionally it is due to monopoly franchises, or contracts for all service in a certain area.

Search terms: Ambulances; Emergency medical services; Ambulance personnel training; Financing; Contracts; California; First aid

1/2 Injuries

HS-011 785 Fld. 1/2; 1/5

TRAFFIC CRASH FATALITIES: INJURY PATTERNS AND OTHER FACTORS

by Tonge, J.I.; O'Reilly, M.J.J.; Davison, A.; Johnston, N.G.

Published in *Medical Journal of Australia* v2 p5-17 (1 Jul 1972)

14refs

The injury patterns found in 908 traffic crash victims are described. The deaths occurred in Brisbane between 1963 and 1968. The multiplicity and pattern of injuries are compared with those found in similar victims during the years 1935 to 1963, and certain significant changes have occurred. Other factors, including the use of seat belts and crash helmets, ejection, duration of survival, the role of alcohol and ambulance services, are discussed.

Search terms: Fatality rates; Fatality causes; Injury statistics; Fatalities by sex; Fatalities by age; Day of week; Time of day; Multiple injuries; Injury severity; Head injuries; Chest injuries; Injuries by body area; Abdominal injuries; Fractures; Accident survival time; Blood alcohol levels; Medical factor caused accidents; Seat belt usage; Helmets; Ejection; Emergency medical services; Brisbane; Accident types

1/3 Investigation

HS-011 786 Fld. 1/3; 1/5

A PRELIMINARY REPORT ON AN ON-THE-SPOT SURVEY OF ACCIDENTS

by Kemp, R.N.; Neilson, I.D.; Staughton, G.C.; Wilkins, H.A.

Transport and Road Res. Lab. (England)

1972 29p 6refs
Report no. TRRL-LR-434

Detailed investigations into how road accidents occur were resumed with an on-the-spot study over a period of seven months in 1968-9. 247 accidents were investigated. Methods of investigation were developed during this study with these objectives: to increase the Laboratory's understanding of road accidents; to provide data to estimate the relative importances of various road safety research projects; to suggest further research and statistical surveys; and to suggest remedial measures. It was found that vehicle factors and road factors each occurred in 25% of the accidents, and that road user factors occurred in 75%.

1/3 Investigation (Cont'd.)

HS-011 786 (Cont'd.)

Braking and tire defects were sufficiently common to suggest that these factors should be studied further. Loss of control occurred in 40% of the accidents. The features of some of the main accident blind spots were studied and remedial measures have been suggested.

Search terms: Accident statistics; Accident factors; Accident investigation; Injury severity; Accident severity index; Defective vehicles; Accidents by vehicle condition; Defective tires; Brake failures; Blind spots; Pavement condition; Accident factors; Highway design; Sign effectiveness; Accident causes; Age factor in accidents; Loss of control caused accidents; Sex factor in accidents; Day vs night accidents; Pedestrian accidents; Driver error caused accidents; Accident location; Highway characteristics; Highway maintenance; Vehicle maintenance; Environmental factors

HS-011 787 Fld. 1/3; 4/7

SIMULATION OF CROSS-MEDIAN CRASHES

by Wright, P.H.; Arrillaga, B.

Published in *Highway Research Record* n388 p13-21 (1972)

3refs

Sponsored by a grant from the National Science Foundation. Sponsored by Highway Research Board Committee on Operational Effects of Geometrics.

This paper reports the results of a simulation study of vehicles crossing the median of a 6-lane expressway at angles of 10 and 50 deg. The effects of crossing angle, lane volume, speed of opposing vehicles, speed of crossing vehicles, median width, perception-reaction time, and skid resistance on the probability of crash and average impact speed were studied. It was found that both probability of crash and average impact speed are most strongly related to crossing angle, median width, and speed of the crossing vehicle. Crash probability and impact speed are more fundamentally dependent on the time required for the vehicle to cross the median. An evaluation of the simulation model and a discussion of the applicability of the results to real traffic conditions are given.

Search terms: Computerized simulation; Simulation models; Variance analysis; Median crossovers; Median crossover collisions; Median width; Traffic volume; Skid resistance; Speed; Impact velocity; Driver reaction time; Accident risk forecasting; Oncoming vehicles; Mathematical models

HS-011 788 Fld. 1/3; 5/4

THE INFLUENCE OF CAR FRONTAL DESIGN ON PEDESTRIAN ACCIDENT TRAUMA

by Fisher, A.J.; Hall, R.R.

Published in *Accident Analysis and Prevention* v4 n1 p47-58 (Mar 1972)

12refs

Routine casualty accident reports in New South Wales, Australia, contain details of vehicles involved and the injuries sustained by pedestrians. It was expected that a reliable estimate could be made as to whether the frontal design of vehicles has any significant influence on the accident injuries sustained by the pedestrians. The intercomparison of the injury potential of vehicle models is made on the basis of the average number of injuries suffered per accident and the pattern of injury locations on the body. There is no significant difference between fatality rates. It was assumed that the injury potential of a frontal design was directly associated with the number of projections on it and their extent and sharpness. There is no significant correlation between the average injury per accident and car model, within a particular make or between overall car makes.

Search terms: Vehicle pedestrian collisions; Injury severity; Front structures; Pedestrian fatalities; Pedestrian injuries; Australia; Accident statistics; Injuries by body area; Pedestrian age; Pedestrian vehicle interface; Bumpers; Injury statistics; Injuries by vehicle make; Impact forces

HS-011 789 Fld. 1/3; 5/20

LET'S LOOK AT SAFETY

by Oertle, V.L.

Published in *Trailer Life* v32 n9 p104-5, 194-6 (Sep 1972)

Case histories of many accidents involving recreational vehicles usually reveal the lack of a complete checkoff system when preparing for a trip. Many accidents still occur due to such well-publicized dangers as: mechanical defects; inadequate clamp-on bumper hitches; trailers that substantially outweigh the towing vehicles; insufficient lighting or reflectors at vital points, usually on the sides and rear; carrying dangerous materials in campers or trailers; carrying tires and motorcycles on rear of the vehicle when not securely fastened; light couplers that are not properly connected; slick tires; worn brake linings; lack of mirrors.

Search terms: Recreational vehicles; Travel trailers; Accident case reports; Campers (truck mounted); Mobile homes; Hitches; Trailer brakes; Vehicle lighting; Reflectors; Exterior rearview mirrors; Towing; Vehicle inspection; Accident causes; Defective vehicles; Transportation of hazardous materials; Night driving; Brake linings; Tire wear; Vehicle weight; Accident risks

1/5 Statistical data

HS-011 790 Fld. 1/5

THE DIFFERENCE IN ROAD TRAFFIC SAFETY IN THE U.S.A.

AND IN THE NETHERLANDS—A STUDY OF STATISTICAL DATA

by Nijveld, H.A.W.

Published in *Accident Analysis and Prevention* v4 n1 p67-73 (Mar 1972)

7refs

An attempt is made to discover whether traffic in the U.S. is safer than traffic in the Netherlands. Traffic fatality statistics of both countries are compared in relation to length of roads, total mortality, population death rate, and mileage death rate. The time-lag in car use is also discussed. Combining the various ways of comparing the two countries, the following tentative conclusions are made. Life in America is more dangerous than that in Holland. This holds true for traffic as well as for other aspects of life. America has, however, a very large road network and many miles of that network are much safer than Dutch roads. In the safety of every effective kilometre covered in some way (car, bicycle, pedestrian) there is a slight advantage at the American side.

> Search terms: Fatality rates; Accident statistics; Netherlands; United States; Rural roads; Urban highways; Highway mileage; Vehicle mileage; Driver fatalities; Passenger fatalities; Statistical analysis; Vehicle usage; Pedestrian fatalities; Bicycle rider fatalities; Motorcycle operator fatalities; Driver mileage; Accident risks; Accident types

2/0 HIGHWAY SAFETY

2/1 Breakaway Structures

HS-011 791 Fld. 2/1

FULL-SCALE VEHICLE CRASH TESTS OF LUMINAIRE SUPPORTS

by Buth, E.; Ivey, D.L.

Published in *Highway Research Record* n386 p52-65 (1972)

5refs

> Sponsored by Highway Research Board Committee on Traffic Safety Barriers and Sign, Signal and Lighting Supports.

A Federal Highway Administration notice circulated on November 16, 1970, allowed a pendulum test to be substituted for a vehicle crash test in testing breakaway luminaire supports. This notice set an allowable momentum change for pendulum tests of 400 lb-sec. It was recognized at that time that the specification was based on a very limited number of tests. FHWA therefore took the lead in setting up additional tests of luminaire supports that would better compare vehicle and pendulum test results. The seven vehicle crash tests that were considered essential to this comparison are reported, evaluated, and compared with pendulum impact tests of identical luminaire supports conducted by Reynolds Metals Company.

> Search terms: Pole impact tests; Pendulum tests; Breakaway light poles; Luminaires

2/2 Communications

HS-011 792 Fld. 2/2

TECHNOLOGICAL PROGRESS IN MOTORIST AID COMMUNICATIONS

by Wainwright, W.S.; Jain, R.

Connecticut Univ.

1972 43p 19refs
Report no. C.E.-72-48

Existing and proposed efforts of various highway and research organizations in the field of motorist aid systems are presented and evaluated. Courtesy patrols, Citizens Band Radio, surveillance programs, roadside call boxes, and cooperative motorist reporting programs are considered in terms of the degree of the effective utilization of the growing technology of communications made by each and in terms of the relative safety and convenience offered by each. Technology exists to implement a superior system for motorist aid. All those concerned with the safety and efficiency of our highway system must concentrate on proceeding full speed ahead toward the goal of installing a uniform, coordinated system of motorist aid communications.

> Search terms: Driver aid systems; Patrolling; Disabled vehicles; Emergency road services; Safety patrols; Economic factors; Citizens band radios; Aerial surveillance; Flash Lights and Send Help Program; Roadside telephones; Radiotelephones; Electronic monitoring systems; Automatic emergency reporting systems; Emergency reporting systems; Traffic surveillance; Roadside radio terminals

2/4 Design and Construction

HS-011 793 Fld. 2/4

CRASH TEST EVALUATION OF STRONG-POST, ENERGY-ABSORBING GUARDRAIL USING A LAPPED W-BEAM FOR TRANSITIONS AND MEDIAN BARRIERS

by Walker, G.W.; Warner, C.Y.

Published in *Highway Research Record* n386 p78-87 (1972)

3refs

> Sponsored by Highway Research Board Committee on Traffic Safety Barriers and Sign, Signal and Lighting Supports.

Crash tests, including tests with human drivers, were performed to evaluate a lapped W-section strong-post guardrail designed for transition sections and median barriers. Energy-absorbing

2/4 Design and Construction (Cont'd.)

HS-011 793 (Cont'd.)

cartridges were used to limit the vehicle loads imposed while keeping rail deflection to a minimum. Results show that full-sized conventional vehicles can survive impacts at a speed of 60 mph and an angle of 10 deg without complete loss of steering control.

Search terms: Guardrail impact tests; Guardrail design; Guardrail posts; Median barrier design; Vermiculite; Test volunteers; Angle impact tests; High speed impact tests; Bridge approaches; Loading tests

HS-011 794 Fld. 2/4; 4/7; 1/5

OPTIMAL STATISTICAL DECISIONS IN HIGHWAY SAFETY RELATED TO GEOMETRIC DESIGN

by Haefner, L.E.

Northwestern Univ.

1970 280p 169refs

Doctoral dissertation.

Four analytic and decision processes in the area of highway safety are investigated: analysis by the traffic engineering profession while focusing on the problem in a broad, multi-dimensional approach; use of operations research with analytic modeling techniques; representation and support of the general public in decision-making processes and the ability of the engineering group involved to translate and interpret the impact of their proposals to them; and integration of research and action into a meaningful framework for maximum effectiveness. The use of a Bayesian decision theory evaluation model is described in detail.

Search terms: Driver vehicle road interfaces; Highway design; Theses; Decision making; Decision theory; Mathematical models; Traffic engineering; Mathematical analysis; Reviews; Bayes theorem; Operations research; Computer programs; Accident causes; Intersection collisions; Accident factors; Linear regression analysis; Stop signs; Accident statistics; Accident severity; Accident costs; Illinois; Systems analysis; California; District of Columbia; Road shoulders; Road grades; Injury rates; Accident rates; Fatality rates; Median crossover collisions; Simulation models; Traffic signal effectiveness; Urban intersections; Accident risk forecasting; Rural accidents; Highway improvements; Urban accidents; Benefit cost analysis; Accident prevention; Road curves; Accident types; Road width; Traffic conflicts; Highway safety programs

HS-011 795 Fld. 2/4; 4/8; 2/6

ROAD SCHOOL (51ST) ANNUAL PROCEEDINGS, PURDUE UNIVERSITY, MARCH 29-APRIL 1, 1965

by Shurig, D.G., comp. and ed.

Published as *Engineering Bulletin of Purdue University* v49 n5 (Sep 1965)

287p refs
Report no. Eng-Extension-Ser-119

Twenty-five papers are presented on highway engineering and safety. Some of them deal specifically with highway studies in Indiana. Subjects included are: roadside development and landscaping, bridge maintenance, highway maintenance, off-street and on-street parking facilities, uniform traffic control devices, urban transportation planning, county transportation systems, highway research, state-federal relationships, railroad grade crossings, and traffic accident analysis.

Search terms: Indiana; Roadside maintenance; Landscaping; Bridge maintenance; Offstreet parking; On street parking; Urban transportation; Transportation planning; Railroad grade crossings; Accident analysis; Bypasses; Axle load measurements; Highway taxation; Highway research; Federal state relationships; Highway maintenance; Traffic control device uniformity; Fort Wayne; Indianapolis; Rural transportation

2/7 Meteorological Conditions

HS-011 796 Fld. 2/7

PRACTICAL NOISE CONTROL FOR ENGINES

by Yerges, L.F.

Yerges (Lyle F.)

Published in HS-011 801, *Engineering Know-How in Engine Design–Part 20* (SP-369), New York, 1972 p24-7

Report no. SAE-720405

Engine noise control involves well-known methods and procedures, and the methods applied successfully to automotive situations can be applied with equal success to nonautomotive equipment. Three case histories are given in which a problem is solved with existing standard equipment by exerting control at the source, along the transmission path, and to the receiver.

Search terms: Engine noise; Noise control; Construction equipment; Compressors; Farm tractors

HS-011 797 Fld. 2/7

THE ABATEMENT OF STRUCTURAL NOISE IN INTERNAL COMBUSTION ENGINES

by Strunk, R.D.

Bolt, Beranek and Newman, Inc.

Published in HS-011 801, *Engineering Know-How in Engine Design–Part 20* (SP-369), New York, 1972 p17-23

10refs
Report no. SAE-720405

The mechanism of structural noise in internal combustion engines is defined, and its abatement is considered. Structural noise is shown to dominate the other sources of engine noise at high frequencies. The abatement of engine structural noise by employing the fundamentals of isolating high-frequency vibrations, reducing the radiation efficiency of finite panels, and damping resonant vibrations is discussed.

Search terms: Engine noise; Internal combustion engines; Noise control; Vibration control; Diesel engines; Acoustic measurement; Vibration isolators; Damping; Physical properties; Sound absorbing materials

HS-011 798 Fld. 2/7

METHODS OF VEHICLE NOISE MEASUREMENT

by Hillquist, R.K.

General Motors Proving Ground

Published in HS-011 801, *Engineering Know-How in Engine Design–Part 20* (SP-369), New York, 1972 p5-7

1ref
Report no. SAE-720403

This paper discusses the various vehicle noise test procedures promulgated by the Society of Automotive Engineers, the International Organization for Standardization, and the American National Standards Institute. It notes some shortcomings of these documents and presents suggestions for improving them. The goal is to make these vehicle procedures more representative of typical operating modes and community exposure problems.

Search terms: Vehicle noise; Acoustic measurement; Noise standards

HS-011 799 Fld. 2/7

ACOUSTIC FUNDAMENTALS AND NOISE

by Miller, J.B.

Wisconsin Univ.

Published in HS-011 801, *Engineering Know-How in Engine Design–Part 20* (SP-369), New York, 1972 p1-4

Report no. SAE-720402

Acoustic noise has been described as sound without value. This paper on acoustic noise is a study of what is called sound, treating of how it is generated, how it is propagated, absorbed, and measured. These specifics are discussed, along with some simple examples of how sound is related to the environment in which it exists.

Search terms: Noise; Acoustic measurement; Acoustics; Sound dissipation

HS-011 800 Fld. 2/7; 3/8; 4/1

NOISE LEGISLATION, PRESENT AND FUTURE, AS RELATED TO PRODUCT DESIGN

by Lincoln, R.H.

Outboard Marine Corp.

Published in HS-011 801, *Engineering Know-How in Engine Design–Part 20* (SP-369), New York, 1972 p8-16

18refs
Report no. SAE-720404

The current and future regulation of product noise levels required by federal, state, and local authority has been surveyed. Probable effects on product design are presented and discussed, with consideration given to specific problems such as: cost/benefit; enforcement, noise-monitoring networks; lead time; technological feasibility; and design concept changes. All these problems are present and must be considered in any coordinated approach to product noise control.

Search terms: Noise control; Noise sources; Federal control; Transportation noise; Local government; Vehicle design; Government industry cooperation

HS-011 801 Fld. 2/7; 5/4

ENGINEERING KNOW-HOW IN ENGINE DESIGN–PART 20

Society of Automotive Engineers, Inc.

1972 31p
Report no. SAE-SP-369

Includes HS-011 796 - 800

A collection of five papers is presented dealing with acoustic and noise fundamentals, noise abatement and control, methods of vehicle noise measurement, and present and future noise legislation as related to product design both for motor vehicles and other types of equipment.

Search terms: Vehicle noise; Acoustics; Noise control; Acoustic measurement; Noise; Engine noise; Noise sources; Noise standards

AVAILABILITY: SAE

2/9 Traffic Control

HS-011 802 Fld. 2/9

DEVELOPMENT OF A NEW LOW-PROFILE HIGHWAY STRIPING FOR WET-NIGHT VISIBILITY. PHASE 1, FEASIBILITY

by Grieser, D.R.; Epstein, M.M.; King, R.W.

Battelle Memorial Inst.

2/9 Traffic Control (Cont'd.)

HS-011 802 (Cont'd.)

1972 67p 12refs
Contract FH-11-7445
Report no. FHWA-RD-72-13; PB-209 423

This study concerns the visibility of lane and edge delineation on highways under wet night conditions. The current program was undertaken to demonstrate the feasibility of using a low-profile corner-cube retroreflector marker to solve the problem of visibility on rainy nights. Molded pieces having a smooth upper surface and capable of being mounted flush with the road surface, or protruding no higher than 1/8 inch above the surface, were fabricated. These pieces were subjected to laboratory evaluation and outdoor road-use experiments to assess their durability and optical performance under wet-night conditions and their resistance to traffic and snowplowing. Experiments with a snowplow indicate that it may be feasible to install markers on top of the pavement and still have them survive the snowplowing operation. Markers exposed to normal downtown and thruway traffic show no appreciable degradation after two months' exposure.

Search terms: Wet road conditions; Night visibility; Wear resistance; Snow plows; Lane markings; Reflectorized pavement markings; Reflectorized road shoulder markings; Adhesives; Polymethacrylates; Polycarbonates; Reflectance; Pavement edge markings

AVAILABILITY: NTIS

HS-011 803 Fld. 2/9

TECHNIQUES OF RAMP CONTROL

by Wainwright, W.S.; Jain, R.

Connecticut Univ.

1972 43p 42refs
Report no. C.E.-72-47

This report deals with the theory and practical application of the various forms of ramp control including ramp closure, fixed-time metering, capacity-demand traffic responsive metering, gap acceptance traffic-responsive ramp metering, ramp metering systems and merging control systems. Major emphasis is given to the necessary conditions, advantages and disadvantages, equipment and instrumentation, application, and effects of each type of ramp control. Several diagrammatic sketches of the features of various actual installations of ramp control are included.

Search terms: Ramp control; Electronic monitoring systems; Ramp control signals; Gap acceptance; Electronic traffic control; Traffic metering controls; Merging capacity; Peak hour traffic control; Traffic metering; Fixed time traffic signals; Changeable message signs; Demand responsive traffic metering

HS-011 804 Fld. 2/9

SAFETY EVALUATION OF FORCED WEAVING AS A TRAFFIC CONTROL MEASURE IN FREEWAY MAINTENANCE OPERATIONS

by Brewer, K.A.

Published in *Highway Research Record* n388 p84-93 (1972)

10refs

Supported by the Iowa State Univ. Engineering Res. Inst. through funds provided by the National Science Foundation. Sponsored by Highway Research Board Committee on Maintenance Operation.

Speed control effectiveness and safety were analyzed for two examples of a traffic sign-traffic cone-traffic barricade pattern developed by the Iowa State Highway Commission. The pattern forces all through traffic to negotiate a single lane in a weaving pattern. The switchback from one lane to another is designed to control speeds. Results indicate that the weaving was highly effective when construction activity was visible; more than 50% of all vehicles sampled traveled below the posted temporary speed limit. When no construction activity was evident or when no forced weaving was used, fewer than 20% of all vehicles sampled complied with the posted speed limit.

Search terms: Detours; Construction site traffic control; Cones; Barriers; Iowa; Speed limit effectiveness; Weaving capacity; Merging capacity; Lane closure signs; Construction site signs; Freeways; Spot speed characteristics; Warning signs; Lane changing; Single lane traffic

HS-011 805 Fld. 2/9; 3/4

EFFECTS OF ROADWAY MARKINGS ON VEHICLES STOPPING IN PEDESTRIAN CROSSWALKS

by Mortimer, R.G.; Nagamachi, M.

Michigan Univ. Hwy. Safety Res. Inst.

1969 34p 5refs

Evaluation was made of the effects of number of lanes, one-way versus two-way traffic, and pavement markings (crosswalk, crosswalk and stop line, end of center line). Sex of driver, type of vehicle, and vehicle direction after stopping were other variables investigated. Vehicles which stopped close to intersections tended to be driven by females, to be trucks rather than passenger cars, and to turn after stopping. Vehicles were also likely to stop farther from the curb line on four-lane than on two-lane roads. The percentage of vehicles stopping on crosswalks was found to be smallest at intersections marked with a crosswalk and a stop line. A tentative recommendation is made for a placement of stop lines.

Search terms: Signalized intersections; Pedestrian crossings; Crosswalks; One

vay traffic; Two way traffic;
'avement markings; Driver sex; Driver
haracteristics; Stopping point;
/ehicle characteristics; Traffic lanes;
/ariance analysis; Driver behavior re-
earch

-011 806 Fld. 2/9; 4/7

VESTIGATION OF LANE
OPS

Goodwin, B.C.; Lawrence, R.L.

lished in *Highway Research Record*
38 p45-61 (1972)

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ponsored by Highway Research
oard Committee on Freeway Opera-
ions. Study sponsored by the
merican Assoc. of State Hwy. Of-
icials in cooperation with the Federal
Iwy. Administration.

jectives of the study were to evaluate
effectiveness of safety and traffic
rations of lane-drop configurations
several freeways. Aerial photographs
e taken of traffic volumes at 3
-drop sites in the Los Angeles area,
e-history trajectories of all vehicles
e computed, and measures of traffic
rations (speeds and concentrations)
safety (potential collisions) were
ermined. No significant differences in
ty effectiveness among the three
figurations were identified, but one
at which the pavement markings
sed the two heavily traveled left lanes
merge had significantly lower speeds
higher concentrations than either of
other sites. The aerial photographic
a reduction system developed during
study allows objective analysis of the
nplex interaction of traffic at lane
ps or at other freeway configurations.
vever, the system needs further
elopment before it can be an
nomical tool for the traffic engineer.

arch terms: Lane drops; Aerial
otography; Highway design; Traffic
nes; Traffic data analysis; Los
Angeles; Freeways; Traffic flow; Following distance; Pavement markings; Traffic control; Traffic volume; Speed studies; Mathematical models; Accident risk forecasting

3/0 HUMAN FACTORS

3/2 Anthropomorphic Data

HS-011 807 Fld. 3/2

HAZARD INDICES AND THEIR RELATIONSHIP TO ANTHROPOMORPHIC DUMMIES

by Brinn, J.

Chrysler Corp.

8p 7refs
Report no. SAE-720441

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Problems associated with the use of anthropomorphic dummies in crash testing of automobiles arise primarily from the non-repeatable behavior of the dummy and from the unknown correlation between its behavior and that of the human. The combination of these factors leads to scatter in test results. Test programs relating to these problem areas are described. These tests demonstrate that the results obtained are heavily dependent on the data analysis scheme employed. Results obtained by use of the mathematical analog technique are compared to other methods. The analog approach is found to minimize scatter in test results. Results of dummy head impacts against windshields are shown to approximate theoretical considerations when the brain analog technique is employed. The study concludes that the organ analog approach appears to analyze dummy test results in a more meaningful manner than other current techniques.

Search terms: Anthropomorphic dummies; Impact tests; Accident simulation; Human body simulation; Injury severity index; Head impact tolerances; Restraint system tests; Windshield impact tests

AVAILABILITY: SAE

3/4 Driver Behavior

HS-011 808 Fld. 3/4

THE EFFECT OF PSYCHOLOGICAL STRESS ON DECISION PROCESSES IN A TRACKING TASK

by Gibbs, C.B.

National Res. Council of Canada

1968 27p 7refs

Reprinted from *DME/NAE Quarterly Bulletin* n4 (1967).

Many forms of psychological stress impair driving ability and are undoubtedly major causes of accidents. Psychological stress can be applied to human beings by the use of alcohol, drugs, or by fatigue, frustration, or many other influences. It is extremely difficult to detect impairment in actual performance because increased expenditure of energy or effort may mask the effects of stress upon the aspects of behavior that are readily observed and measured. There is a serious shortage of rapid, sensitive tests of the effects of stress upon those aspects of skill that are known to be important in controlling vehicles. In an effort to provide more sensitive measures, an instrument called the stressalyzer was developed to provide a rapid and simple test of a person's ability to control a machine. The stressalyzer was used to test the effects of sleep deprivation, disturbed sleep, and the combination of sleep loss and alcohol on driver skill.

Search terms: Stress (psychology); Decision making; Driver performance under stress; Sleep deprivation;

3/4 Driver Behavior (Cont'd.)

HS-011 808 (Cont'd.)

Alcohol effects; Driver reaction time; Driver skills; Driving simulation; Tracking; Driving task analysis; Driver physiological test devices

HS-011 809 Fld. 3/4; 5/11

BETTER DRIVING

Anonymous

Published in *Autocar* v136 n3968 p2-7 (4 May 1972)

This is the first of a three part series designed to improve driver performance. The discussion deals with the maintenance of the automobile to ensure its reliability and safety, driver performance and courtesy, and smoothness in the operation of the vehicle.

Search terms: Automobile maintenance; Driver skills; Vehicle inspection; Seat belt usage; Psychological factors; Driver improvement; Driver behavior; Driver attitudes; Windshield dirt accumulation; Driving tasks

HS-011 810 Fld. 3/4

BETTER DRIVING. [PT. 2.]. ANTICIPATION

Anonymous

Published in *Autocar* v136 n3969 p9-15 (11 May 1972)

This second of a three part series designed to improve driver performance suggests that the driver learn to anticipate situations in which there might be traffic risks and that he be able to see clearly by keeping windows clean and utilizing mirrors effectively. Tips are also given on steering, stopping, and skid control.

Search terms: Driver behavior; Attention lapses; Defensive driving; Driver performance; Driver reaction time; Rearview mirrors; Fog lamps; Steering; Stopping distance; Braking; Skid control; Driving tasks; Hazard perception; Vehicle visibility

HS-011 811 Fld. 3/4; 3/12

DETECTION OF THE SIGN OF RELATIVE MOTION WHEN FOLLOWING A VEHICLE

by Evans, L.; Rothery, R.

General Motors Res. Labs.

[1971] 77p 19refs

Prepared for publication in *Human Factors*.

The ability to detect the sign of relative motion in the driving situation was investigated on a freeway. Subject passengers in an instrumented vehicle were given controlled looks, normally of four second duration, at a lead car. It was the subjects' task to estimate whether the two cars had come closer or moved further apart. The comparative ability of nine stimulus functions to predict the detection of the sign of relative motion was examined. One of the most consistent effects observed was a response bias in favor of indicating that the cars had come closer when they had not. The results indicate considerable sensitivity to the sign of relative motion. For example, if a lead car were closing on a following car at 3 mph the following driver's probability of correctly identifying the sign of relative motion as negative rather than positive after a four second observation is 0.99 when the spacing is 200 ft.

Search terms: Car following; Distance headways; Following distance; Gap acceptance; Vehicle spacing; Distance perception; Driver reaction time; Motion perception; Test volunteers; Mathematical analysis; Acceleration detection; Freeway driving; Motion threshold; Visual perception

3/5 Driver Education

HS-011 812 Fld. 3/5

AN ADVANCED DRIVER EDUCATION PROGRAM THAT OFFERS A REALISTIC APPROACH TO DRIVING EMERGENCIES

by Girling, D.

Published in *American Youth* v13 n1 p24-31 (Mar-Apr 1972)

The minimum 30 hours of classroom and six hours of in-car instruction has become the standard in most driver education programs. This is hardly enough to provide new drivers with more than the bare bones of driving knowledge. General Motors has designed an advanced driver education course which teaches drivers how to cope with certain driving emergencies. In this program the student is exposed to simulated emergency situations while performing actual driving tasks. The course includes off-road recovery techniques; handling tire failures; evasive maneuvers; controlled braking exercises; skid control; and car handling at maximum controllable speed through a serpentine or slalom course.

Search terms: Driver education; Behind the wheel instruction; Tire failures; Braking; Steering; Driver skills; Driver emergency responses; Accident avoidance; Automobile handling; Skid control; Automobile driving ranges; Emergency training

HS-011 813 Fld. 3/5

MARGIN FOR ERROR

Anonymous

Published in *Automotive Fleet* v11 n7 p22-4 (May 1972)

Based on the premise that driver education can change drivers, at least in skill level and emergency response, thus substantially contributing to accident avoidance, Cornell Aeronautical Lab. is developing a driver's training program. This program would attempt to increase driver skills by exposing drivers to mock emergency situations and giving experience in evasive maneuvering, where the car is performing at its limit. This experience is something very few drivers ever get.

Search terms: Behind the wheel instruction; Accident avoidance; Driver emergency responses; Driver skills; Braking; Vehicle control; Steering; Driver education; Automobile handling; Emergency training; Skid pans

HS-011 814 Fld. 3/5

CLOSING THE GAPS IN DRIVER EDUCATION

Anonymous

Published in *Journal of American Insurance* v48 n3 p29-32 (May-Jun 1972)

Most driver education specialists feel that inexperience is the young driver's biggest single handicap. Real-life on-the-road experience seems to be the key factor that is missing in driver education programs. The establishment of emergency driving ranges is suggested as a possible solution. On the course, students go over maneuvers which are necessary in emergency situations and repeat these maneuvers until they are capable of control in emergency situations. The emergency situations designed into the range include skid control, braking and controlled stopping, off road recovery, evasive and serpentine maneuvers, and tire blowout.

Search terms: Young adult drivers; Adolescent drivers; Driver experience; Driver education; Behind the wheel instruction; Automobile driving ranges; Driver emergency responses; Skid control; Braking; Driving tasks; Accident avoidance; Tire failures

HS-011 815 Fld. 3/5; 4/7

THE EFFECTIVENESS OF A UNIFORM TRAFFIC SCHOOL CURRICULUM FOR NEGLIGENT DRIVERS

by Harano, R.M.; Peck, R.C.

Published in *Accident Analysis and Prevention* v4 n1 p13-45 (Mar 1972)

20refs

An evaluation of the Uniform Driver Improvement School (UDIS), an experimental education program for problem drivers, is presented. The program is evaluated in terms of its overall effectiveness in reducing subsequent accidents and violations, as well as the relation between its effectiveness and driver characteristics. The school is also evaluated in terms of cost effectiveness.

Search terms: Driver improvement measurement; Driver improvement schools; Driver criminal history; Driver records; Traffic law violations; Problem drivers; Driver improvement; Driver age; Male drivers; Female drivers; Marital status; Factor analysis; Regression analysis; Accident repeater drivers; Questionnaires; Benefit cost analysis; Accident rates; Variance analysis; Driver characteristics

3/7 Drugs Other Than Alcohol

HS-011 816 Fld. 3/7

EFFECT OF MARIHUANA ON RISK ACCEPTANCE IN A SIMULATED PASSING TASK

by Dott, A.B.

Public Health Service

1972 28p 24refs
Report no. ICRL-RR-71-3; DHEW (HSM)-72-10010

Twelve male marijuana users operated an optical driving simulator under a nonsmoking condition and under three conditions after smoking crude marijuana leaf. Each subject was given the opportunity to pass a lead car with the assistance of a passing aid device under conditions of varying risk. No differences in performance were noted between the nonsmoking and placebo conditions. No differences in performance were noted during any of the emergency conditions. Subjects under the influence of marijuana completed fewer passes and took more time to make the elective decision as to whether to pass. They did not have more accidents. It is concluded that chronic users under the influence of marijuana are less likely to accept risks than users not under the influence of marijuana. It is not clear whether this represents a compensatory mechanism for perceived disability or a lack of motivation as an effect of the drug.

Search terms: Marijuana; Driving simulators; Decision making; Driver emergency responses; Risk taking; Driver performance; Drug effects; Passing; Passing aid systems; Placebos; Test volunteers; Driver reaction time; Heart rate; Driver psychological tests

AVAILABILITY: GPO

3/12 Vision

HS-011 817 Fld. 3/12

AN EYE-MARK CAMERA FOR USE IN DRIVER BEHAVIOUR STUDIES

by Rutley, K.S.

Published in *Medical and Biological Engineering* v10 p101-3 (1972)

1ref

3/12 Vision (Cont'd.)

HS-011 817 (Cont'd.)

The only valid way to evaluate the attention-getting properties of a signal is to find out whether the driver looks at it. In order to do this a method is required of continuously and accurately recording where a driver is looking. Of the various different eye movement recording techniques that exist, there is, one method suitable for use with a driver by means of which a continuous record of the actual viewpoint may be obtained. This is recorded as a point of light on a cine film record of the view in front of the observer. The Eye Mark Camera used in this method is described and evaluated. Observations of film taken with the equipment during normal driving on the road have shown that the accuracy is adequate to determine what the driver is looking at in most driving situations.

> Search terms: Eye movements; Cinematography; Stabilization; Calibration; Head movement; Visual behavior; Test equipment; Photographic equipment

HS-011 818 Fld. 3/12; 4/5

COMPARISON STUDY BY COMPUTER SIMULATION OF THE DRIVER'S VISUAL PART-TASK DURING LEFT AND RIGHT FREEWAY MERGING MANEUVERS

by DeCabooter, P.H.; Sinha, K.C.

Published in *Highway Research Record* n388 p1-12 (1972)

8refs

> Sponsored by Highway Research Board Committee on Operational Effects of Geometrics.

The purpose of this study was to determine whether there is a quantifiable difference in the mechanical elements of the driver's visual part-tasks associated with left on-ramp merges as compared with mirror-image right on-ramp merges. The visual part-task is hindered by the physical imitations of gross movements of the head. A general computer model was developed to simulate dynamically the visual part-task associated with the merging maneuvers. The results as obtained from the simulation runs clearly showed that there is a significant difference in the ramp driver's ability to see the vehicles traveling on the freeway when he is merging from the left and when he is merging from the right. In addition, the closer a driver is to the ramp nose the less will be the chance that he can see the critical freeway vehicle before he merges.

> Search terms: Vision; Field of view; Eye movements; Ramps; Blind spots; Merging; Computerized simulation; Eye location; Freeway driving; Driving task analysis; Head motion range; Kinesthetic perception; Simulation models; Driver vehicle interface; Human body kinematics; Rear visibility

4/0 OTHER SAFETY-RELATED AREAS

4/3 Cost Effectiveness

HS-011 819 Fld. 4/3; 1/4

TRAVEL TIME AND ACCIDENT BENEFITS DUE TO RECONSTRUCTION OF U.S. 52 BYPASS AT LAFAYETTE, INDIANA. PROGRESS REPORT

by McNeil, A.E.

Joint Hwy. Res. Proj.

1971 161p 41refs
Report no. PR-9

Travel time and accident benefits were evaluated for the portion of the bypass reconstructed during 1968-69 and were found to be substantial. The dollar value of such benefits in fact was estimated to be in excess of the dollar costs of the reconstruction. Other benefits to the community, the land adjacent to the highway, and the highway user resulted in a conclusion that the reconstruction is a good investment. Some of the effect on the nonuser was evaluated by examining the land-use changes that have occurred along the roadway since the reconstruction.

> Search terms: Benefit cost analysis; Accident location; Accident types; Intersection collisions; Travel time; Bypasses; Highway improvements; Traffic volume; Traffic data analysis; Vehicle operating costs; Accident costs; Accident severity; Injury costs; Damage costs; Fatalities; Accident scale drawings; T test; Correlation analysis; Variance analysis; Land usage; Time costs; Lafayette (Ind.); Traffic flow; Accident rates

4/7 Mathematical Sciences

HS-011 820 Fld. 4/7; 1/3

APPLICATION OF LIMIT ANALYSIS TO THE EVALUATION OF AUTOMOBILE STRUCTURAL COMPONENT DAMAGE DURING LOW SPEED COLLISIONS. FINAL TECHNICAL REPORT

by Culkowski, P.M.; Miller, P.M.

Cornell Aeronautical Lab., Inc.

1972 149p 6refs
Contract CC-173
Report no. CAL-VJ-2968-V-1

> Prepared for the National Assoc. of Independent Insurers.

To determine the degree of structural component damage, the limit analysis technique of plasticity theory was applied to, frame/chassis type automobiles undergoing front and rear center impacts with pole barriers. Subsequently, 5 mph and 10 mph collision tests were performed to determine the relative accuracy of this approach for the purpose of assessing automobile damage susceptibility. Exceedingly close correspondence was observed between theoretical and experimental results for the 5 mph collisions. Initial results indicated that further refinements in the structural modeling was desirable for the 10 mph impacts. Refinements were made and the improvement in the theoretical results validated through an additional series of 10 mph impact tests. The present method of analysis, although having demonstrated the feasibility of using a simplified method of structural analysis for predicting automobile structural damage, is restricted to a particular class of automobiles undergoing a specific type of collision.

Search terms: Structural deformation analysis; Dynamic tests; Static tests; Front structures; Collision models; Damage patterns; Limit analysis; Impact forces; Deflection; Damage severity; Deformation analysis; Bumpers; Barrier collision tests; Front end collisions; Rear end collisions; Ford Galaxy; Chevrolets; Rear structures; Computer programs; Load bearing capacity; Low speed impact tests; Damage estimation; Mathematical analysis; Crashworthiness

5/0 VEHICLE SAFETY

HS-011 821 Fld. 5/0

MOTOR VEHICLE SAFETY AND ENVIRONMENTAL INVENTORY. SAE TECHNICAL COMMITTEE STANDARDS, RECOMMENDED PRACTICES, AND CURRENT PROJECTS, 9TH ED.

Society of Automotive Engineers, Inc.

1972 32p refs
Report no. SAE-SP-371

This brochure provides a compilation of SAE technical committee standards activities related to safety of motor vehicles and their occupants. It includes a list of standards, recommended practices and information reports which have been developed by SAE technical committees and published by the society. It also provides a list of projects in which these technical committees are engaged. This edition includes a supplement which reports SAE technical committee reports and projects in other public interest areas, including air pollution, vehicle noise and vehicle security. The inventory concentrates particularly on standards for motor vehicles operating on public highways.

Search terms: Vehicle safety standards; Vehicle design; Automotive engineering; Human factors engineering; Bibliographies; Emission standards; Brake systems; Electric systems

AVAILABILITY: SAE

5/4 Design

HS-011 822 Fld. 5/4

TESTING VEHICLES AT PEUGEOT

by Rapin, P.

Automobiles Peugeot (France)

1967 8p

Presented at the Instrumentation and Test Techniques For Motor Vehicles Symposium, Cranfield, 4-5 Jul 1967, Co-sponsored by the Institution of Mechanical Engineers and the Advanced School of Automobile Engineering.

Powerful means to test automobiles are now available. However, they are expensive and the problem today is to use them with efficiency and profit. The purpose of vehicle testing is to acquire information necessary to give the customer a better, cheaper and more reliable car. A description of how vehicle testing is handled at Peugeot is given.

Search terms: Automobile tests; Performance tests; Vehicle safety; Durability tests; Test equipment; Proving grounds; Test facilities; Instrumentation; Vibration tests

5/6 Fuel Systems

HS-011 823 Fld. 5/6

WHAT LEAD ADDITIVES DO TO EMISSIONS CONTROL SYSTEMS

Anonymous

Published in *SAE Journal of Automotive Engineering* v80 n5 p32-5 (May 1972)

9refs

Based on the final report *Assessment of Effects of Lead Additives in Gasoline on Emissions Control Systems that Might Be Used to Meet 1975-6 Motor Vehicle Emission Standards,* prepared by Aerospace Corp. for Environmental Protection Agency.

An assessment of the effects of lead additives in gasoline on emissions control systems undertaken for EPA in accordance with the provisions of the Clean Air Act is presented. In general, catalytic activity and lifetime decrease as lead content of the gasoline is increased.

Search terms: Lead; Catalysts; Thermal reactors; Alloys; Catalyst tests; Tetraethyl lead; Exhaust emission control device tests; Exhaust composition; Catalytic converters; Lead free gasoline; Leaded gasoline; Low lead gasoline; Corrosion resistance; Exhaust gas recirculation

HS-011 824 Fld. 5/6; 3/8

CARBON MONOXIDE: A BIBLIOGRAPHY WITH ABSTRACTS

by Cooper, A.G., comp.

Public Health Service

5/6 Fuel Systems (Cont'd.)

HS-011 824 (Cont'd.)

1966 450p 1100refs
Report no. PHS-Pub-1503

References are arranged under broad subject categories: analysis, biological effects, blood chemistry, control, criteria and standards, instruments and techniques, sampling and network operations, and sources. This bibliography covers publications from 1880 to 1966.

Search terms: Carbon monoxide; Air pollution effect on health; Air pollution effect on animals; Air pollution control; Air pollution measurement; Air pollution sources; Carbon monoxide poisoning; Air quality standards; Bibliographies; Abstracts; Air pollution emission factors; Blood analysis

AVAILABILITY: GPO $2.50

HS-011 825 Fld. 5/6; 3/8

A SURVEY OF AUTOMOTIVE EMISSIONS

by Lockhart, L.B.; Ali, A.W.; Mange, P.W.

Naval Res. Lab.

1971 43p 30refs
Report no. NRL-MR-2346; AD-738 799

A survey has been made of the generation, dispersal, and removal processes for the various automotive emissions and their natural counterparts in the atmosphere, and of their effects on man and his environment. In only a few categories (i.e., CO, Pb) are automotive emissions of significance relative to other anthropogenic or natural sources of pollutants in the atmosphere as a whole; however, localized effects can be overriding as a result of peculiar geographical or meteorological factors. Under certain conditions of pouplation density, automobile usage, and weather, photochemically modified automotive effluents have approached the threshold toxicity limits for susceptible individuals and plants. Upon the breakup of smog-producing inversion conditions, normal atmospheric processes of photooxidation and deposition rapidly return the atmosphere to its near-primitive purity. There are apparently no significant long-term atmospheric changes that man might produce which cannot be rapidly reversed at any time by man's curtailment of his own activities.

Search terms: Air pollution emission factors; Vehicle air pollution; Air pollution sources; Environmental factors; Air pollution dispersion; Air pollution effect on health; Air pollution effect on trees and plants; Carbon monoxide; Hydrocarbons; Nitrogen oxides; Photochemical reactions; Smog; Particulate air pollutants; Tire wear; Brake lining materials; Asbestos; Wind

AVAILABILITY: NTIS

HS-011 826 Fld. 5/6; 4/3; 5/11

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOL. 1. EXECUTIVE SUMMARY

TRW Systems Group

1971 55p 14refs
Report no. PB-206 885

In support of APRAC Project No. CAPE-13-68 for Coordinating Res. Council, Inc. and Environmental Protection Agency. A joint effort by TRW Systems Group and its subcontractor, Scott Res. Labs.

The general framework of the study focuses on those system elements which affect the ranking of the alternative inspection and maintenance procedures in an economic effectiveness sense. The tasks include: systems definition; statistical characterization of vehicle maintenance states in an urban region; development of procedures for inspecting and maintaining those malfunctioning engine parameters which significantly influence emissions; and development of a computerized system model for evaluating the candidate procedures within a systematic application framework. A summary of these tasks is presented in this volume.

Search terms: Exhaust emission control; Engine inspection; Vehicle maintenance; Engine operating conditions; Exhaust emissions measurement; Preventive maintenance; Engine failures; Hydrocarbons; Carbon monoxide; Air injection reactor systems; Systems analysis; Engine modification; Nitric oxide; Idling; Inspection costs; Inspection effectiveness; Benefit cost analysis; Air fuel ratio; Ignition timing; Inspection procedures; Computerized simulation; Flow charts; Parameters

AVAILABILITY: NTIS

HS-011 827 Fld. 5/6; 4/3; 5/11

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOL. 2. MODELING OF INSPECTION/MAINTENANCE SYSTEMS

TRW Systems Group

1972 101p 11refs
Report no. PB-206 886

In support of APRAC Project No. CAPE-13-68 for Coordinating Res. Council, Inc. and Environmental Protection Agency. A joint effort by TRW Systems Group and its subcontractor, Scott Res. Labs.

The study involved the following work sequence: preparation of a literature survey and direct discussions with automobile manufacturers and associations, statistical evaluations of acquired data, and construction of an internally consistent system model. The following were among the conclusions drawn. The six most effective engine parameters to maintain in a mandatory inspection/maintenance program are three idle adjustments (air-to-fuel ratio, rpm and timing), elements of the ignition system when causing misfire and induction system components including positive crankcase ventilation valve and air cleaner. The air injection (reactor) system should also be inspected and maintained on vehicles equipped with this type of pollution control equipment. Control of both hydrocarbon and carbon monoxide emissions requires inspection and maintenance of the ignition and induction systems in addition to the idle parameters. Seven other conclusions are discussed.

Search terms: Exhaust emission control; Engine inspection; Vehicle maintenance; Inspection procedures; Mathematical models; Systems analysis; Engine operating conditions; Parameters; Preventive maintenance; Idling; Air filters; Engine failures; Flow charts; Engine modification; Hydrocarbons; Carbon monoxide; Air injection reactor system; Ignition timing; Inspection costs; Benefit cost analysis; Simulation models; Nitric oxide; Positive crankcase ventilation; Computerized simulation; Inspection effectiveness; Inspection stations; Regression analysis

AVAILABILITY: NTIS

HS-011 828 Fld. 5/6; 4/3; 5/11

THE ECONOMIC EFFECTIVENESS OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOL. 3. INSPECTION/MAINTENANCE PROCEDURES DEVELOPMENT

TRW Systems Group

1971 195p 11refs
Report no. PB-206 887

In support of APRAC Project No. CAPE-13-68 for Coordinating Res. Council, Inc. and Environmental Protection Agency. A joint effort by TRW Systems Group and its subcontractor, Scott Res. Labs.

The experimental data were developed from the following sequence of investigations: an engine parameter field survey to characterize the general maintenance state of vehicle emission control systems, a screening experiment to select the most frequent and extensive malfunctioned engine parameters; a definitive experiment to select and evaluate the most effective parameters to maintain in an inspection as determined by combining the data from two previous experiments.

Search terms: Exhaust emission control device maintenance; Engine inspection; Vehicle maintenance; Inspection procedures; Engine failures; Idling; Air filters; Air injection reactor systems; Ignition systems; Carburetors; Hydrocarbons; Statistical analysis; Carbon monoxide; Nitric oxide; Exhaust emission tests; Inspection equipment; Engine modification; Inspection effectiveness; Computerized simulation; Automobile models; Ignition timing; Engine operating conditions; Parameters; Flow charts

AVAILABILITY: NTIS

5/12 Manufacturers, Distributors, and Dealers

HS-011 829 Fld. 5/12

THE CHALLENGE FACING THE AUTOMOTIVE INDUSTRY IN THE NEXT DECADE

by Brock, H.L.

Society of Automotive Engineers, Inc.

1971 7p
Report no. SAE-710877

Challenges to the automotive industry are discussed in terms of: the increase in transportation need and speeds; the impact of population density; the mutuality of technology and social goals; the influence of governmental regulation on design and innovation; and the training of engineers.

Search terms: Automotive industry; Transportation problems; Federal control; Vehicle design; Engineers; Population density; Sociological factors

AVAILABILITY: SAE

5/14 Occupant Protection

HS-011 830 Fld. 5/14

DEVELOPMENT PROBLEMS WITH INFLATABLE RESTRAINTS IN SMALL PASSENGER VEHICLES

by Seiffert, U.W.; Borenius, G.H.

Volkswagenwerk A.G. (West Germany)

1972 14p 3refs
Report no. SAE-720409

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Theoretical considerations on air bag systems, especially for small cars, are discussed. Typical design parameters for the Volkswagen air bag systems are given, together with test data from sled and full scale crash tests. Acceptable small car systems cannot be achieved simply by scaling down large car systems because of differences in vehicle deceleration characteristics and passenger compartment layout. An extensive development effort is required to achieve for small cars the 30 mph performance levels attained by large car air bag systems already. It is concluded that the air bag is not clearly superior to other restraints and that the consumer

5/14 Occupant Protection (Cont'd.)

HS-011 830 (Cont'd.)

should be allowed to select the type of restraint system for his vehicle.

Search terms: Air bag inflation devices; Air bag restraint systems; Barrier collision tests; Deceleration; Impact sleds; Air bag inflation time; Sensors; Occupant kinematics; Knee restraints; Compressed gases; Propellant actuated devices; Impact tests; Volkswagens; Pyrotechnic igniters; Compact automobiles; Vehicle size

AVAILABILITY: SAE

HS-011 831 Fld. 5/14

AIR CUSHION SYSTEMS FOR FULL-SIZED CARS

by Pflug, J.A.

Ford Motor Co.

1972 9p
Report no. SAE-720408

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

The initial air cushion research by Ford and suppliers has primarily involved full-sized cars. Technical approaches for these cars in packaging, kinematics, sensing, and deployment are presented. Also, efforts to meet the requirements of the potential restraint standard as well as to resolve real world problems are discussed.

Search terms: Air cushions; Air bag restraint systems; Injury severity index; Noise tolerances; Reliability; Head impact tolerances; Air bag deployment forces; Safety standards compliance; Vehicle size; Ear injuries; Occupant kinematics; Service life

AVAILABILITY: SAE

HS-011 832 Fld. 5/14

AIR CUSHION RESTRAINT SYSTEMS DEVELOPMENT AND VEHICLE APPLICATION

by Campbell, D.D.

General Motors Corp.

1972 9p
Report no. SAE-720407

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

The discussion presented in this paper includes: A design review of General Motors air cushion restraint system, performance in dynamic testing, and the General Motors program for production build and fleet tryout. Among the items covered in the design review are: The driver's restraint system, the front passenger's restraint system, and the sensing mechanism. The discussion of air cushion system performance testing includes: The text matrix, two significant crash configurations, the importance of variable inflation levels, and the need to continue baboon and human volunteer testing. The discussion of the General Motors pilot production build and fleet tryout program covers the purpose for gaining "on-road" air cushion system experience.

Search terms: Sensors; Air cushions; Front seat passengers; Knee restraints; Gas generators; Restraint system tests; Air bag restraint systems; Performance tests; Stored gas inflation devices; Air bag inflation devices; Baboons; Test volunteers

AVAILABILITY: SAE

HS-011 833 Fld. 5/14

PASSIVE AND SEMI-PASSIVE SEAT BELTS FOR INCREASED OCCUPANT SAFETY

by Johannessen, H.G.; Yates, G.A.

Hamill Mfg. Co.

1972 18p 18refs
Report no. SAE-720438

Presented at 2nd International Confe ence on Passive Restraints, Detroi 22-25 May 1972.

Developments leading to passive se belts are discussed. A problem semantics is identified, and a distinctic is drawn between passive and sem passive seat belts. A low-injury passi seat belt precursor is described, having continuous webbing loop for lap ar shoulder belt and an emergency-lockir retractor. The seat belt system indicat potential for improving upon prese seat belt systems, and with identifiab modifications, being converted into passive occupant restraint configuratio and being later modified to provic 40-mph crash survival capability.

Search terms: Ignition restraint syste interlocks; Passive restraint system Three point restraint system Dummies; Impact tests; Accider simulation; Blanket restraint system Restraint system tests; Restraint sy tem assembly anchorages; Enterin and leaving automobiles

AVAILABILITY: SAE

HS-011 834 Fld. 5/14

THE AUTOMATIC CUSHIO RESTRAINT—A NEW PASSIV SAFETY SYSTEM

by Grime, G.

Britax Ltd. (England)

1972 7p 7refs
Report no. SAE-720439

Presented at 2nd International Confe ence on Passive Restraints, Detroi 22-25 May 1972.

The new passive restraint syster comprises a pad or cushion automatica ly retained in place against the chest of car occupant, and a knee restraint. In normal circumstances, the chest restraint is held in contact with the occupant by light spring pressure so that he is free to lean forward to reach door handles and the like; in an accident, the arm supporting the pad is locked in position, and forward movement of the chest is then controlled by the force exerted by the pad. Variation of this force with distance is determined by the characteristics of an energy absorber, which governs the movement of the arm. The forward movement of the lower part of the body is controlled by the knee restraint which must be capable of considerable deformation. Both calculation and results of sled tests indicate that the system is likely to give good protection in frontal impacts, while extensive driving experience with prototype installations has produced favorable opinions on its acceptability to the driving public.

Search terms: Knee restraints; Impact protection; Passive restraint systems; Energy absorbing systems; Impact tests; Crash cushions; Chest restraints

AVAILABILITY: SAE

HS-011 835 Fld. 5/14

AIRBAG EFFECTS ON THE OUT-OF-POSITION CHILD

by Patrick, L.M.; Nyquist, G.W.

Wayne State Univ.

1972 10p
Report no. SAE-720442

Presented at the 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Because there is the least amount of data on the tolerance of children to impact, the out-of-position child was used in experiments involving airbag systems. After careful consideration it was decided that a primate of approximately the same weight as a child be used, which would provide the most realistic evaluation of potential injuries. The animal chosen for the experimental program was the baboon. Five distinct positions were chosen and this paper describes in detail the experimental physiological conditions and results.

Search terms: Air bag restraint systems; Baboons; Restraint system tests; Air bag caused injuries; Dummies. Child safety; Child injuries; Impact caused injuries; Occupant positioning

AVAILABILITY: SAE

HS-011 836 Fld. 5/14

REQUIREMENTS FOR AIR BAG RESTRAINT ENERGY SOURCES

by Hayosh, R.J.; Gutherie, A.L.

Ford Motor Co.

1972 10p
Report no. SAE-720412

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

One of the sub-systems of air bag passive restraint systems presently under examination for automotive application is the energy source sub-system. The function of the energy source is to provide, release, and control a volume of gas at a rapid rate to inflate the air bag. Three basic types of energy sources are described, these being stored gas, generated gas, and hybrid sources. Both liquid cooled and gas cooled hybrid sources are mentioned. The automotive requirements for application of energy sources are discussed in terms of performance objectives for passive restraints, particularly for front seat passenger air bags. The requirements include minimum package size and weight, ability to perform in hot and cold as well as normal environments, freedom from degradation during the service life, high reliability, controlled toxicity and heat, and ability for safe disposal during vehicle recycling. Two new types of inflation systems which are to improve versatility are mentioned. These systems are to provide either secondary inflations or multiple deployment speeds depending on their design.

Search terms: Gas generators; Compressed gases; Sensors; Toxicity; Propellant activated devices; Reliability; Air bag inflation devices; Restraint system effectiveness

AVAILABILITY: SAE

HS-011 837 Fld. 5/14

CRASH SENSORS FOR INFLATABLE OCCUPANT RESTRAINT SYSTEMS

by Pujdowski, E.

Eaton Corp.

1972 10p 4refs
Report no. SAE-720420

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Several inflatable occupant restraint system crash sensors are compared with respect to operating principle, performance, and potential vehicular use. Desirable characteristics of the sensor mount are described. Forward mounted crash sensors are discussed as a means of providing early crash discrimination. Rough road and barrier test results with crash sensors are reviewed.

Search terms: Sensors; Detectors; Air bag restraint systems; Barrier collision tests; Fire walls; Impact velocity; Optical detectors; Air bag inflation devices; Surface roughness; Microwave systems; Acceleration; Ultrasonic devices

AVAILABILITY: SAE

HS-011 838 Fld. 5/14

DEVELOPMENT OF A RADAR SENSOR FOR INFLATABLE OCCUPANT RESTRAINT SYSTEM

by Takahashi, T.; Makino, T.; Sato, K.

Toyota Motor Co., Ltd. (Japan)

1972 12p
Report no. SAE-720422

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

The important characteristic of the Toyota radar sensor is that an optimum highly sensitive sensing zone is formed by the combination of two transmission antennas and two reception antennas in order to improve the collision judgment accuracy, minimize the difference of precollision time for various obstacles, and suppress the received signal level due to rain and snow. The prevention of interference is discussed.

> Search terms: Sensors; Air bag restraint systems; Doppler effect; Antennas; Impact velocity; Detectors; Air bag inflation devices; Computerized simulation; Compact automobiles; Japanese vehicles; Radar; Velocity perception; Microwave systems; Electromagnetic interference

AVAILABILITY: SAE

HS-011 839 Fld. 5/14

A MICROWAVE ANTICIPATORY CRASH SENSOR FOR AUTOMOBILES

by Hopkins, J.B.; Holstrom, F.R.; Hazel, M.E.; White, E.; Newfell, T.

Department of Transp.

1972 15p 3refs
Report no. SAE-720423

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

An anticipatory crash sensor for actuation of deployable passive restraint systems has been developed. The system consists of a 10 GH_z continuous wave (CW) doppler radar. In operation, position discrimination is achieved through use of separate receiving and transmitting antennas, located on opposite sides of the front of the vehicle. An object is detected only when within the region of overlap of the two antenna patterns. Velocity discrimination has been achieved very simply in both digital and linear realizations. A threshold circuit permits adjustment of the minimum target size to which the sensor will respond. A variety of circuit and antenna configurations has been examined and constructed to obtain optimal system performance. These include hybrid systems which make use of mechanical confirmation of impact in an intermediate speed range, and more elaborate antenna configurations. Characteristics of typical targets have been determined experimentally. In addition, studies are being carried out to permit preliminary estimates of cost and reliability for production sensors, and–using available accident data–to indicate the probable effectiveness of such systems.

> Search terms: Sensors; Radar; Detectors; Doppler effect; Antennas; Velocity perception; Microwave systems; Target detection; Reliability; Air bag inflation devices; Air bag inflation time; Mathematical models

AVAILABILITY: SAE

HS-011 840 Fld. 5/14

CRASH DETECTOR DEVELOPMENT

by Bell, L.E.

Allied Chemical Corp.; Technar, Inc.

1972 12p 7refs
Report no. SAE-720421

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Within the past several years many crash detector concepts have been evaluated for use in automobiles. The experience gained in the process of detector development has lead to several useful new design techniques. In this paper, under the general categories of design methods and design verification procedures, special applications of failure mode analysis, design perturbation analysis and inadvertent actuation prediction techniques are discussed. The design of rolamite acceleration-time detectors and the concept of fail safe and self-diagnostic design are presented as applications of specific methods.

> Search terms: Sensors; Passive restraint systems; Detectors; Fail safe systems; Computerized simulation; Laboratory tests; Acceleration detection; Perturbation

AVAILABILITY: SAE

HS-011 841 Fld. 5/14

DEVELOPMENT OF THE CRASH SENSOR/VEHICLE INTERFACE

by Termaat, K.B.; Freeman, K.A.

Ford Motor Co.

1972 28p 8refs
Report no. SAE-720425

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

This paper defines requirements and describes a development program for inertial-mechanical sensors. Inertial, or deceleration-sensitive devices are simple in construction in that integration of the crash signal is accomplished by motion of the sensor mass. Crash sensor interfacing with the automobile must be approached from the occupant protection standpoint. Generation of the crash pulse, which determines occupant response, is affected by complex vehicle variables that often preclude discrimination from non-crash signals. Synthesis of the design solution is approached on a systems basis to match sensor capability to vehicle variables. Reliability is provided for with appropriate design of experiments and statistical analysis.

> Search terms: Sensors; Air bag restraint systems; Air bag inflation devices; Occupant kinematics; Barrier impact forces; Crash response forecasting; Acceleration; Reliability; Restraint system effectiveness; Ear injuries; Air bag deployment forces; Surface roughness; Sensor location; Remote sensing; Barrier collision tests; Deceleration; Statistical analysis; Noise tolerances; Displacement; Occupant protection; Air bag inflation time

AVAILABILITY: SAE

HS-011 842 Fld. 5/14

A CONSUMER CASE FOR THE AIR BAG AND THE PROBLEM OF PUBLIC ACCEPTANCE

by Dodge, L.

Center for Auto Safety

1972 8p 10refs
Report no. SAE-720427

> Presented at the 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Impositions placed on vehicle occupants by safety belts and safety belt use are substantial and will increase as systems to encourage or force belt usage are incorporated. By comparison, the known impositions of air bags are minor, but to these must be added other requirements, the extent of which are not yet well-known. Substantial fleet testing of air bags will clarify most of these inconveniences. Automobile manufacturers and the National Highway Traffic Safety Administration have failed to generate public support for the air bag. Lack of consumer support will continue unless greater resources are allocated to equip fleet vehicles with air bag systems so that a reliable record of air-bag efficacy can be compiled.

> Search terms: Air bag restraint systems; Consumer attitudes; Consumer acceptance; Consumer preferences; Public opinion; Restraint system usage; Advertising; Restraint system tests; Safety device costs

AVAILABILITY: SAE

HS-011 843 Fld. 5/14

CONSUMER ACCEPTANCE OF THE VOLVO PASSIVE BELT SYSTEM

by Bohlin, N.; Pilhall, S.

Volvo A.B. (Sweden)

1972 9p 2refs
Report no. SAE-720428

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

Consumers' acceptance of and attitude toward a passive three-point belt system have been studied and evaluated in a personal interview investigation of 325 people. These participants were provided with the opportunity to try out the belt system in two demonstration cars–2-door and 4-door sedans. The method of selecting the respondents complied very well with the requirements of public representation. The results of the inquiry are presented in the full survey as related to driver, passenger, age, sex, etc. The main question in the study–the convenience when entering or leaving the demonstration car–was very positively judged. The most frequent opinion on a 7-point evaluation scale was as high as 7 (most positive); the average value of 6.2-5.9 was given for wide- and half-open doors, respectively.

> Search terms: Three point restraint systems; Consumer acceptance; Consumer attitudes; Opinion polls; Questionnaires; Passive restraint systems; Entering and leaving automobiles; Volvos

AVAILABILITY: SAE

HS-011 844 Fld. 5/14; 4/7

A BASIC AIRBAG MODEL

by Nefske, D.J.

General Motors Res. Labs.

1972 35p 7refs
Report no. SAE-720426; GMR-1202

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

A mathematical simulation of the operation of a compressed-gas airbag system is developed. A system was built and tested, and the analysis is evaluated on the basis of these tests. Included in the study are nonideal gas effects, manifold and diffuser effects, bag stretch, bag leakage, and overpressurization of the passenger compartment. Interaction between a single rigid object and the bag is also considered. A correlation between bag pressure and the force it generates is obtained. This allows the development of an analytic model for determining the motion of a single rigid mass interacting with a dynamically inflating airbag mounted in a moving vehicle. An application of the model to study rebound of the occupant from the airbag is presented.

> Search terms: Air bag restraint systems; Air bag inflation devices; Compressed gases; Air bag inflation pressure; Mathematical models; Static tests; Dynamic tests; Air bag deployment forces; Air bag inflation time; Occupant kinetics; Simulation models; Restraint system tests

AVAILABILITY: SAE

HS-011 845 Fld. 5/14; 4/7

ENERGY REQUIREMENTS–CORRELATION BETWEEN OCCUPANT, BAG AND INFLATOR

by Talley, C.P.; Hamilton, B.K.

Allied Chemical Corp.

1972 17p 2refs
Report no. SAE-720415

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972. Includes HS-011 846 - 847

Two papers dealing with a computer model of a hybrid air cushion inflator and a systems analysis of gas cushion/occupant interactions are presented.

> Search terms: Air cushions; Gas generators; Computerized simulation; Simulation models; Systems analysis

AVAILABILITY: SAE

HS-011 846 Fld. 5/14; 4/7

A MODEL OF THE HYBRID PYROTECHNIC STORED GAS INFLATOR

by Hamilton, B.K.; Young, C.

Allied Chemical Corp.

Published in HS-011 845, *Energy Requirements–Correlation between Occupant, Bag and Inflator* (SAE-720415), New York, 1972 p2-9

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

A computer model of a hybrid Air Cushion inflator has been developed which models existing systems to a high degree of accuracy. Gas Generator size and ballistic properties, stored gas composition, storage pressure, volume, temperature and receiving tank parameters can be varied to accurately predict the effects of system changes on inflatior performance.

> Search terms: Air cushions; Gas generators; Computerized simulation; Pyrotechnic igniters; Propellant actuated devices; Air bag inflation devices; Stored gas inflation devices

HS-011 847 Fld. 5/14; 4/7

GAS CUSHION SYSTEMS ANALYSIS, OCCUPANT–CUSHION INTERACTIONS

by Talley, C.P.; Chakravarti, K.; Finlow, D.E.; Wright, W.H.

Allied Chemical Corp.

Published in HS-011 845, *Energy Requirements–Correlation between Occupant, Bag and Inflator* (SAE-720415), New York, p1-7

2refs

> Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

A simplified approach for analytically obtaining equations of motion for torsos during contact with gas cushions in frontal collisions and subsequent ride-down characteristics has been developed. From these equations, calculations of torso "g" forces, cushion pressures, and other system parameters can be made. Comparison of calculated values and those obtained experimentally are in good agreement. Utilizing this approach, it appears possible to optimize gas cushion system parameters in terms of desired torso response under a variety of design criteria as a guide to system design and experimental verification. Such parameters include cushion configuration, fabric permeability, and temperature, type, and quantity of gas introduced before and during torso impact.

> Search terms: Air cushions; Equations of motion; Human body kinetics; Simulation models; Systems analysis; Laboratory tests; Permeability; Scale models; Head on impact tests; Mathematical models; Energy absorption

5/15 Propulsion Systems

HS-011 848 Fld. 5/15

ALTERNATIVE POWER PLANTS FOR AUTOMOTIVE PURPOSES

by Estes, E.M.

Published in *Institution of Mechanical Engineers Proceedings* v186 n11 p125-40 (1972)

> Prepared for presentation to the Institution of Mechanical Engineers, London, 13 Mar 1972, as the James Clayton Lecture.

Recent U. S. legislation requires a 90% reduction in present levels of automotive emissions by 1975-76. This lecture reviews progress made by General Motors Corp. in evaluating the relative feasibility of various alternative power plants: radically modified spark-ignition gasoline engines, including rotary combustion engines, stratified-charge engines, and intake valve throttled engines; diesel engine; gas turbine; battery and fuel cell; hybrid engine-electric; Stirling; and Rankine cycle, including steam.

> Search terms: Exhaust emission control; Wankel engines; General Motors Corp.; Rotary engines; Stratified charge engines; Diesel engines; Exhaust gas recirculation; Gas turbine engines; Electric vehicles; Hybrid engines; Stirling engines; Propulsion systems; Steam engines; Spark ignition engines; Rankine cycle engines; Batteries; Fuel cells; Engine design; Intake valves; Fuel injection

5/16 Registration

HS-011 849 Fld. 5/16

MOTOR VEHICLE IDENTIFICATION NUMBER PRACTICES

by Dixon, M.W.

General Motors Corp.

8p

> Presented to American Assoc. of Motor Vehicle Administrators, Committee on Engineering and Vehicle Inspection, 11 Apr 1972.

The VIN (vehicle identification number) serves a vital role in the operations of motor vehicle departments as well as local and national law enforcement agencies, the auto insurance industry, and federal government. The vehicle manufacturers also utilize the VIN in their operations to serve as a control base for production, for sales activities, in service operations, and for market analysis. Examples are given of the VIN systems of several manufacturers. State laws and vehicle safety standards regulating the VIN numbers and their location in the automobile are discussed. SAE standards and recommendations are mentioned.

> Search terms: Vehicle identification numbers; Automobile identification; Vehicle safety standards; State laws

5/21 Used Vehicles

HS-011 850 Fld. 5/21; 5/9

THE LIFE EXPECTANCY OF PASSENGER CARS, CALCULATED IN 1972

Svensk Bilprovning A.B. (Sweden)

1972 15p

The life expectancy of passenger cars decreased appreciably during the 1950's and in the beginning of the 1960's. The development of car life expectancy in Sweden shows a very obvious difference from that of the USA. There is an actual decrease in life expectancy of passenger cars in the USA over the years up to and including 1970. In Sweden, however, the trend was broken in the middle of the 1960's and after that the tendency has been clearly directed towards increasing life expectancy. Tables present the life expectancy for the most common makes of passenger cars over the years 1963-1971. Vehicle inspection was expected to decrease life expectancy of cars, but this has not been the case.

> Search terms: Automobile scrap statistics; Life expectancy; Sweden; United States; Vehicle age; Automobile models; Inspection effectiveness; Service life; Scrapped automobiles

5/22 Wheel Systems

HS-011 851 Fld. 5/22

PERFORMANCE OF TREAD COMPOUNDS IN VARIOUS TIRE CONSTRUCTIONS

by Wilder; C.R.; Haws, J.R.

Published in *Rubber Chemistry and Technology* v45 n1 p10-5 (Mar 1972)

> Presented at a meeting of the Div. of Rubber Chemistry, American Chemical Society, Cleveland 12-15 Oct 1971.

This report shows the relationship of two rubbers and two carbon blacks evaluated on retreaded tires of bias, bias-belted, and radial construction. The polymers examined in this tread-wear test were a low vinyl, 85/15 butadiene/styrene, solution-polymerized copolymer, extended with 37.5 phr of highly aromatic oil compared to a 40/60 blend of cis-polybutadiene and SBR 1712. A roadwear performance evaluation was also made between N330 and an improved N347 type black designated as N339. The so-called improved types of tread blacks are the result of recent developments in reactor technology and generally exhibit better road wear characteristics compared with conventional types. The performance of these products is described.

> Search terms: Tire treads; Retreaded tires; Bias tires; Bias belted tires; Radial tires; Rubber compounds; Carbon black; Polymers; Vinyl resins; Styrene; Tire tests; Tire wear measurement; Road tests; Polybutadiene; Abrasion tests; Butadienes; Tire performance; Tire materials; Performance tests

HS-011 852 Fld. 5/22

AN IMPROVED WIRE ADHESION TEST METHOD

by Hicks, A.E.; Chirico, V.E.; Ulmer, J.D.

Published in *Rubber Chemistry and Technology* v45 n1 p26-40 (Mar 1972)

> Presented at a meeting of Div. of Rubber Chemistry, American Chemical Society, Cleveland, 12-15 Oct 1971.

Rapid growth of the usage of steel cables in tires and transportation belts in recent years finds the rubber industry in a state of limited technology for the evaluation of wire adhesion. This paper describes a wire adhesion test method developed at the Cities Service Research Center which uses a slot free technique (CSRC method). The evaluation of some effects of carbon black and compounding variables on wire adhesion as measured by this slot free method is also included.

> Search terms: Steel wire; Rubber; Adhesion; Carbon black; Laboratory tests; Rubber compounding; Vulcanizing; Sulfur; Materials tests

HS-011 853 Fld. 5/22; 4/7

DEVELOPMENT OF A MATHEMATICAL MODEL FOR PREDICTION OF TIRE PERFORMANCE CHARACTERISTICS

by Schuring; D.F.; Roland, R.D. Jr.

5/22 Wheel Systems (Cont'd.)

HS-011 853 (Cont'd.)

Cornell Aeronautical Lab., Inc.

1972 106p 117refs
Report no. CAL-YD-2984-K-1

The proposed program is a first step in the application of finite-element techniques to tire mechanics. Its outstanding features are the treatment of the tire carcass as an isotropic composite; the use of laminated shell elements, and a no-penetration loading technique. The laminated shell element is expected to deal realistically with multiple ply arrangements. The no-penetration loading technique computes external loads from prescribed zero-displacement of all nodes in contact with the ground. Thus, it increments tire axis displacements rather than tire loads. As a result, tire stress distribution in the contact area and tire loads (along with internal stresses and strains) are computed as an output rather than dealt with as an input. In this way, no assumptions about the contact stress distribution have to be made. This method lends itself naturally to include side forces and braking torques.

Search terms: Tire performance; Tire characteristics; Tire defects; Tire forces; Mathematical models; Tire loads; Tire cords; Tire ply number; Tire materials; Tire mechanics; Finite element method; Computerized simulation; Stress analysis; Tire properties; Mathematical analysis

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 696 Fld. 3/1

BREATH EXAMINER SPECIALIST INSTRUCTOR TRAINING INSTITUTE. FINAL REPORT

by Cleven, A.

Dunlap and Associates, Inc.

1972 145p
Contract DOT-HS-099-1-140

Report for June 21, 1971 through June 30, 1972.

The purpose of this study was to expose key individuals to the NHTSA-developed curriculum materials for breath examiner specialist and to teach them how to teach. The objective was accomplished through the conduct of five 30-hour instructor training institutes conducted in various areas of the country. Institutes were held in the spring of 1972. A total of 77 enrollees completed the training program. They came from 42 states plus Puerto Rico and the District of Columbia. With regard to their current BES training, most enrollees are associated with on-going programs. Most of these are state-wide programs. Sixty-eight of the attendees reported that they expect to use all or some of the NHTSA curriculum materials for their future BES training. 96% of the enrollees reported that the institute was quite valuable or exceptionally valuable to them as instructors.

Search terms: Curricula; Instruction materials; Instructor training; Program evaluation; Alcohol breath tests; Breath analysis

AVAILABILITY: NTIS

NHTSA Imprints

HS-820 221 Fld. 2/0; 1/5

SAFETY '71. A REPORT ON ACTIVITIES UNDER THE HIGHWAY SAFETY ACT, JANUARY 1, 1971-DECEMBER 31, 1971. VOL. 2

National Hwy. Traf. Safety Administration

1972 147p 56refs

Report to Congress.

The administration of the Highway Safety Act of 1966, as amended, focused on four general problems: alcohol in its relation to traffic safety; traffic law enforcement; driver control and improvement; and traffic engineering services. Each of these four national emphasis programs was intended to enhance program standards, 16 of which are discussed. Other parts of the report cover technological progress through research, the public's right to know, and administration and funding. A list of NHTSA publications is included.

Search terms: Highway Safety Act of 1966; Highway safety standards; Accident statistics; Injury statistics; Fatality rates; Traffic law enforcement; Alcohol Safety Action Projects; Traffic engineering; Federal aid; Consumer protection; Public information programs; Highway safety programs; Safety research; Annual reports; Alcohol usage deterrents; Drinking drivers; Driver characteristics; Financing

AVAILABILITY: GPO $1.25

HS-820 222 Fld. 5/0; 1/5

SAFETY '71. A REPORT ON ACTIVITIES UNDER THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JANUARY 1, 1971-DECEMBER 31, 1971. VOL. 2

National Hwy. Traf. Safety Administration

1972 141p 56refs

Report to Congress.

The administration of the National Traffic and Motor Vehicle Safety Act of 1966, as amended, focused on six general efforts: program plan for motor vehicle safety standards; rulemaking activities; standards enforcement activities; defects investigation activities; the Compliance Test Facility; and the National Motor Vehicle Safety Advisory Council. Each of these emphasis programs was intended to enhance program standards. Other parts of the report cover technological progress through research, the National Driver Register, the public's right to know, and administration and funding. A list of NHTSA publications is included. Accident statistical compilations are also included.

Search terms: National Traffic and Motor Vehicle Safety Act of 1966; Accident statistics; Injury statistics; Vehicle safety standards; Highway safety programs; Defective vehicles; Safety research; Safety cars; Accident survivability; Crashworthiness; Accident investigation; National Driver Register; Consumer protection; Public information programs; Federal role; Federal aid; Fatality rates; Safety standards compliance; Compliance tests; Annual reports; Rule making; Experimental vehicles; Occupant protection; Impact tests

AVAILABILITY: GPO $1.25

HS-820 223 Fld. 2/0; 5/0

SAFETY '71. A REPORT ON THE ACTIVITIES OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION AND THE FEDERAL HIGHWAY ADMINISTRATION UNDER THE HIGHWAY SAFETY ACT OF 1966 AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT OF 1966

National Hwy. Traf. Safety Administration

1972 73p

Despite the pessimistic aspect of the record, there is a positive side to the highway safety picture. The role of NHTSA and FHWA in reversing the trend of human and material destruction are discussed. NHTSA has identified the principal priority programs, and 72% of its contract research budget has been channeled to their support. They are: crash survivability, alcohol countermeasures program, and experimental safety vehicles.

Search terms: Highway Safety Act of 1966; National Traffic and Motor Vehicle Safety Act of 1966; Highway safety standards; Vehicle safety standards; Safety programs effectiveness; Federal control; Safety design; Accident survivability; Drinking drivers; Safety cars; Defective vehicles; Priorities; Recall campaigns; Traffic law enforcement; Accident investigation; Restraint system usage; Driver licensing; National Driver Register; Public information programs. Crashworthiness; Annual reports; Experimental vehicles; Alcohol usage deterrents; Highway safety programs; Occupant protection

AVAILABILITY: GPO $1.50

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III	Regional Administrator, NHTSA, Room 817 Federal Building, 31 Hopkins Plaza, Baltimore, Maryland 21201 Tel: 301-962-3878. (Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia)
IV	Regional Administrator, NHTSA, (Suite 400) 1720 Peachtree Road, N.W., Atlanta, Georgia 30309, Tel: 404-526-5537. (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee)
V	Regional Administrator, NHTSA, Suite 214, Executive Plaza, 1010 Dixie Highway, Chicago Heights, Illinois 60411, Tel: 312-756-1950 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin)
VI	Regional Administrator, NHTSA, 819 Taylor Street, Room 11A26, Forth Worth, Texas 76102, Tel: 817-334-2021. (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas)
VII	Regional Administrator, NHTSA, P.O. Box 7085, Country Club Station, Kansas City, Missouri 64113, Tel: 816-361-0860 (Ext. 7887) (Iowa, Kansas, Missouri, and Nebraska)
VIII	Regional Administrator, NHTSA, 330 South Garrison Street Lakewood, Colorado 80226, Tel: 303-234-3253 (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming)
IX	Regional Administrator, NHTSA, 450 Golden Gate Avenue, Box 36112, San Francisco, California 94102. Tel: 415-556-6415 (Arizona, California, Hawaii, and Nevada)
X	Regional Administrator, NHTSA, 5140 Federal Office Building, Seattle, Washington 98104, Tel: 206-442-5934 (Alaska, Idaho, Oregon, and Washington)